

NOVEMBER/DECEMBER 2024

23PECH14A — ELECTROCHEMISTRY

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Give Arrhenius theory of electrolysis.
2. Calculate the ionic strength for 0.2 m $\text{Al}_2(\text{SO}_4)_3$.
3. State the origin of electrical double layer.
4. State the Lippmann equation.
5. Define symmetry factor.
6. What do you meant by standard electrode?
7. Define over voltage.
8. Draw and delineate Evan's diagrams.
9. Mention the principle of Square wave polarography.
10. Briefly point out the fuel cell with an example.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss the Debye-Hückel theory of mean ionic activity coefficients.

Or

(b) How is the activity coefficient of strong electrolyte determined?

12. (a) With the perspective of Helmholtz-Perrin theory, discuss the structure of electrified interfaces.

Or

(b) Discuss the Stern theory of electrical double layer.

13. (a) Derive Nernst equation and explain the terms involved in it.

Or

(b) Write note on polarizable and non-polarizable electrodes.

14. (a) Explain any three types of over voltages.

Or

(b) Illustrate the mechanism involved in the oxygen evolution reaction.

15. (a) Explain the principle and applications of Polarography.

Or

(b) Discuss the construction principle of alkaline fuel cell with mechanistic detail.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive Debye-Hückel limiting law. How is it verified? Mention its applications.

17. How Guoy-Chapman model is used to explain the electrical double layer, observed in electrolyte solutions?

18. Discuss the theoretical investigation of the kinetics of an electrode reaction leading to Butler-Volmer equation and Tafel equation.

19. Derive Butler-Volmer equation for one step electron transfer reactions.

20. What are capacitors? Discuss about mechanism of energy storage, charging at constant current and constant voltage.
